Learning goals, policies, schedule

Why do I teach this course?

"All that stuff I was taught about evolution, embryology, the Big Bang theory, all that is lies straight from the pit of hell."

U.S. Rep. Paul Broun, R-Ga
September 27, 2012

Broun, *a medical doctor by training*, believes that the earth is less than 9000 years old and that everything was created in six literal days. He has served on the House Committee on Science, Space and Technology!

We must not expect our leaders to be any better informed or rational than the majority of their constituents. Therefore my overall goal is to help produce informed citizens when it comes to important issues related to science and technology and, in particular, biological science.

In the syllabus, I have listed several major learning objectives toward achievement of that goal. These objectives are far more about learning concepts and ways of thinking than they are about remembering facts. I hope that you will enjoy this approach to learning science and that Bioc 122 becomes one of your favorite courses at Rice.

Very truly yours,

David R. Caprette

Course learning goals

No concepts are more fundamental to biology than common ancestry and natural selection (i.e., evolution). Physical explanations for the formation of the earth, appearance of life on earth, and origin of species are common themes that will run throughout the course. Regarding these explanations, each student should be able to:

- cite the evidence
- explain how the evidence led to the explanation
- explain the faulty reasoning behind myths and misconceptions surrounding the explanation

In addition, each student should be able to correctly explain what is mean by a scientific theory. Each student must be able to distinguish what is in the realm of science from what is not in the realm of science, and to be able to distinguish what a theory claims from what it does not claim.

Objective 1: Obtain a working knowledge of fundamental concepts in biology

Including:

- learn the respective roles of types of macromolecules in living cells
- learn the roles of organelles in the function of cells, tissues, organs, and organisms
- learn the fundamentals of gene expression
- be able to provide the evidence and reasoning behind the theories of common ancestry (a.k.a., descent with modification or, simply, evolution) and natural selection

Objective 2: Contribute to the public's level scientific literacy, namely an understanding of the nature, process, and relevance of science

- learn to apply skepticism of a scientist
- learn to distinguish scientific fact from fiction, theory from conjecture, valid from spurious arguments, and to distinguish truth from myth or misconceptions
- be able to cite examples of the slow, deliberate, progressive nature of science
- be prepared to challenge spurious claims and arguments that misrepresent scientific concepts and/or the process of science

Objective 3: Understand the consequences of gene expression

- be able to explain how gene expression leads to phenotypes, including complex and monogenic traits
- be able to explain long term changes in gene expression in the form of evolution of new species
- be able to cite examples of normal changes in gene expression, e.g., during development
- be able to cite examples of how gene expression can go wrong - e.g., cancer as an example of uncontrolled gene expression

Objective 4: Be able to recognize and access credible sources of information in biological and biomedical science

Policies, Topics, and Activities for Spring 2015

Most of the learning in this course will take place in class, through hands-on activities, group work, interaction with the instructor, and of course some lecture material. There is no textbook. We will start with an introduction to the light microscope and a laboratory experience using the microscope, then work with some basic concepts concerning the biology of cells, tissues, and organs. We will then launch into the main themes starting with the process of science, possible origins of life on earth, evolution of species, genetics of complex traits, and special topics in biology. Your on-time attendance is essential. Each Powerpoint presentation listed in the syllabus will be posted as a pdf (slides only) immediately following the corresponding presentation. Links to web resources and additional files such as "handouts" may also be posted in the Resources section.

Course instructor

Dr. David Caprette, ABL 327 (Anderson Biological Laboratories, third floor), 713-348-3498, caprette@rice.edu, office hours 11 am to 1 pm Monday, Tuesday, and Thursday or by appointment. Please notify Dr. Caprette of any problem concerning attendance, grading, or course materials.

Honor code policy

Students must work individually on all assignments posted in Tests & Quizzes, with no assistance from other students unless otherwise noted. All assignments are otherwise "open resource," meaning that students may have access to their notes, posted resources and other reference materials while working on an assignment. You must answer homework questions in your own words. Do not plagiarize. For example, you must not answer a question with a quotation from a web site. Please consult the document on plagiarism that I've posted in Resources if you are not sure what does or does not constitute plagiarism.

Absences, late arrivals, and late assignments. The honor code applies to requests to be excused from participation or for permission to submit an assignment late. Legitimate excuses for missing class include circumstances beyond your control such as illness, death in the family, travel for athletics, graduate school interviews, etc. Students arriving late to class without an acceptable excuse will receive partial credit for attendance. Any student experiencing a problem submitting an assignment must contact the instructor immediately. Ten percent of the available score will be deducted per day an assignment is late.

Learning activities

In class we will conduct group work, discussions, and hands-on activities to go along with the lecture material. We will also use "clicker slides" with an audience response system to check your understanding of concepts and to address misconceptions. Every student is expected to arrive on time each day with a working i>Clicker+ handset. NOTE: To promote full participation in class and to avoid distractions, you are asked to silence or shut off all electronic devices and to keep your laptops closed, unless otherwise instructed.

Pre-class preparation. Most classes will require completing a pre-class assignment in Tests & Quizzes. The questions are designed to make you think and to ready you for a classroom discussion. A few of the pre-class assignments will be graded and a score recorded. Graded assignments will be identified as such.

- You will receive full credit for a pre-class assignment if you complete all of the questions (correctly, if the assignment is graded) and attend the corresponding class
- If you complete a pre-class assignment but miss the corresponding class, then the assignment will not count toward your course grade
- If you fail to complete a pre-class assignment a zero will be recorded

Attendance. You will receive a score of 100% for each day with on-time attendance.

Participation. Your instructor will frequently pose questions to the class, and will expect someone to answer. To encourage active participation you will receive extra credit for each time that you speak up.

Minute questions. In most classes you will be given 1 to 3 minutes to answer a question on an index card that will be passed out some time during class, often at the very start. Minute questions will be graded and will count toward your final grade in the class.

Homework assignments

All homework assignments will be completed on Owl-Space and will become available at least one week before they are due. Questions will be a mix of short answer/essay and multiple choice questions. The due date for each homework assignment is posted in the course syllabus. It is advisable to start early in case there is a connection failure. The assignments are not timed and answers can be saved and an assignment re-visited repeatedly prior to submission. I will do my best to grade each assignment within a week of submission and will provide feedback on most of the questions (and all answers that do not receive full credit) when I release the grade.

Students with disabilities

Any student with a documented disability needing adjustments or accommodations is requested to speak with the course coordinator during the first two weeks of class. All discussions will remain confidential. Such students should also contact Disability Support Services in the Ley Student Center.

Course grade

Please check for feedback on homework assignments (Tests & Quizzes) and on your score for learning activities (Gradebook). You will receive feedback on learning activities at three to four week intervals so that you can correct any errors.

- Learning activities, 40%
  - Each pre-class preparation assignment, day's attendance, participation score, and minute question counts equally toward the total.
- Homework assignments, 60%
  - Each homework assignment counts equally toward the total

Grade cutoffs are as follows: ≥ 97% = A+; 93-97 = A; 90-93 = A-; 87-90 = B+; 83-87 = B; 80-83 = B; 77-80 = C+; 73-77 = C; 70-73 = C-; 67-70 = D+; 63-67 = D; 60-63 = D-

Schedule

BIOC 122 will meet Tuesdays and Thursdays from 10:50 am to 12:05 pm in Rayzor Hall Rm. 123. The following schedule is subject to change, including possible addition of pre-class assignments and possible changes to listed assignments.

Green – to be completed before class
Blue – assignment due by the end of the day (midnight)
Red – holiday or break

Day/date	Topic	Assignment(s)	Resource(s)
Tues Jan 13	The light microscope as an instrument for studying biology	• Complete the pre-class preparation for Day 1 ("Day 01 Preparation," in Tests & Quizzes) • Have an i>Clicker+ handset ready to go before class; register your clicker (Tests & Quizzes)	Two_eyes.pdf
Thurs Jan 15	Microscopy laboratory, ABL 141	• Peruse the resource in advance of class	Why_we_don't_drink.pdf
Tues Jan 20	Organize groups, introductions, group behavior exercise, research on cell organelles	• Peruse the resource in advance of class • Complete "Day 03 preparation" • Bring a laptop and/or general biology text if available	Elite_8_handout.pdf
Thurs Jan 22	Organelles "Elite 8" tournament	• Complete "Day 04 preparation"	Elite_8_handout.pdf
Tues Jan 27	Organelle review & some rather interesting facts regarding metabolism	• Complete "Day 05 preparation" • HW1: Microscopy	Thin_air.pdf
Thurs Jan 29	Properties and biological importance of water	• Complete "Day 06 preparation"	Sixty_percent.pdf
Tues Feb 3	Bone, blood, circulation	• HW2: Cells & organelles	Red_stuff.pdf
Thurs Feb 5	The process of science	• Complete "Day 08 preparation"	Science.pdf
Tues Feb 10	Evolution of the universe, origin of life on Earth	• HW3: Properties of water • Complete "Day 09 preparation"	Origins.pdf

Thurs Feb 12	Origin of species – evidence for descent with modification	• HW4: Bone, blood, and circulation • Complete "Day 10 preparation"	Change.pdf
Tues Feb 17	Origin of species – evidence for natural selection	• HW5: Process of science • Complete "Day 11 preparation"	Fitness.pdf
Thurs Feb 19	Evolution of Altruism	• HW6: "Origins"	Altruism.pdf
Tues Feb 24	Genetics pt. 1 – Phenotypes, genotypes, and chromosome theory	• Complete "Day 13 preparation" (start early – you may have to do some background research)	Dodger.pdf
Thurs Feb 26	Finish Genetics pt. 1	• HW7: Origin of species	Dodger.pdf
	Spring Break – no classes Mar 2-6		
Tues Mar 10	Genetics pt. 2 – Discovery of DNA	• Complete "Day 15 preparation" with the aid of the recommended on-line videos (extended to Oct 21, late penalty applies)	Photo_51.pdf
Thurs Mar 12	Genetics pt. 3 – DNA replication, transcription, translation, and the central dogma	• HW8: Genetics pts 1 and 2	Dogma.pdf
Tues Mar 17	Genetics pt. 4 – Mutations, human genetic diseases, pedigrees	• Complete "Day 17 preparation"	Woody.pdf
Thurs Mar 19	Finish Genetics pt. 4	• Complete "Day 18 preparation"	Woody.pdf
Tues Mar 24	Genetics pt. 5 – An introduction to gene regulation		Altitude.pdf
Thurs Mar 26	Finish Genetics pt. 5 and wrap up, inlcuding Belyaev's arctic fox experiment	• HW9: Genetics pts 3 and 4	Altitude.pdf, Foxes.pdf
Tues Mar 31	Developmental biology pt. 1	• Complete "Day 21 preparation"	Immortality.pdf
	Mid term break – no classes Apr 2-3		
Tues Apr 7	Developmental biology pt. 2		Sex.pdf
Thurs Apr 9	Neuroscience pt. 1	• Complete "Day 24 preparation" • HW10: Genetics parts 5 and 6	Animal_electricity.pdf
Tues Apr 14	Neuroscience pt. 2		Learning.pdf
Thurs Apr 16	Neuroscience pt. 3	• HW 11: Development pts. 1 and 2	Perception.pdf
Tues Apr 21	Bacteria, viruses, and antibiotics	• Complete "Day 27 preparation"	Resistance_is_futile.pdf
Thurs Apr 23	Personal genomics	• HW12: Neuroscience	Who_are_you.pdf
Thurs Apr 29		• HW 13: Bacteria, viruses, and antibiotics, and personal genomics	